

MTCA Science Advisory Board Meeting Summary

May 28, 2004
9:00 am – 3:30 pm

EPA Region X
1200 6th Avenue
Denali Room
Seattle WA

Key Agenda Item: Defining Moderate Levels of Lead in Soils.

Agenda Items:

Introductory Remarks
Discussion: Defining Moderate Levels – Lead
Public Comment
Discussion: Defining Moderate Levels – Lead (Continuation of Morning Discussion)
Overview – Defining Moderate Levels – Arsenic
Public Comment
Next Steps

Attendees:

SAB Members: Dr. Hank Landau; Dr. Bruce Duncan; Dr. Elaine Faustman; Dr. Marjorie Norman
Agency Staff: Dave Bradley; Michael Feldcamp; Dawn Hooper; Pete Kmet.
Public: Rob Duff; Greg Glass; Warren Hanson; Karen Pickett; Jim W. White.

Introductory Remarks and Review of March 18th Meeting Summary

The Board reviewed and approved the March 18th meeting summary which included changes recommended by the Board based on their review of the draft meeting summary.

Dr. Landau provided some observations based on his recent trip to China that relate to (1) the balance between analysis and action; and (2) different approaches for balancing analysis and action in closed versus open societies. Specifically, he was struck by the fact that you rarely hear birds singing in many parts of China which he learned was the end result of a government order to kill all birds during the Cultural Revolution. The original order was an attempt to reduce the transmission of certain types of diseases. However, the decimation of the bird population removed one check on insect populations and subsequent increases in those populations provided another pathway for disease transmission and triggered a large increase in pesticide use. Dr. Landau noted that the original government order was issued with very little review and discussion which, had it occurred, might have altered the government's plans and averted today's problems. He contrasted the governments actions in China with the deliberative processes used in the United States. He noted that, while such review processes can be very slow, they serve a valuable purpose in preventing adverse side effects/unintended consequences associated with proposed actions.

Defining Moderate Levels of Lead in Soils – Summary of Previous Discussions

Dave Bradley provided a brief summary of the information and issues discussed by the Board at the two previous meetings (January 12th and March 18th). Before discussing the specific issues included in the discussion materials, the Board discussed several elements of the general framework. Many of these points were also discussed later in the meeting.

- Actions to Reduce Exposure: Dr. Norman noted that the overall goal is to identify soil concentrations where certain types of actions should be taken to reduce lead exposure. Consequently, she stated that it is important to connect actions to reduce exposure to particular exposure pathways (risk > pathways > actions). When evaluating the reasonableness of different concentration/action combinations, she stated that it is important to understand what consequences certain actions are expected to have in terms of reducing exposure.
- Soil Exposure: Dr. Faustman stated that it was important to keep in mind that the issues before the Board focused on the contribution of soil exposure to elevated blood lead concentrations. Within this context, the Board recommended that Ecology focus on those exposure pathways that represent significant contributors to overall exposure. Dr. Faustman recommended that the Board focus its review on the level of conservatism build into the models being used to predict soil-related exposure.
- Blood Lead Concentrations and Multiple Categories: Dr. Faustman expressed the opinion that the blood lead concentration (10 ug/dL) used by Ecology to establish the low end of the moderate range may be too high given recent scientific studies on the health effects associated with blood lead concentrations less than 10 ug/dL. She stated (and other members of the Board appeared to agree) that Ecology should rely on the CDC guidelines which she believes will ultimately include recommendations for actions (e.g. additional testing, intervention measures) for children with blood lead concentrations between 5 and 10 ug/dL. The Board explored several options for incorporating this information into the overall framework and suggested that Ecology consider dividing the moderate range into two parts: (1) soil concentrations below 250 mg/kg where certain types of actions would be encouraged and/or recommended and (2) soil concentrations above 250 mg/kg where certain types of actions would be encouraged and/or recommended or (in some cases) required. Dr. Norman noted that this type of approach is analogous to the approach used by EPA when establishing drinking water standards. Under that approach, EPA established a health-based goal (maximum concentration limit goal (MCLG)) and then establishes the regulatory limit (maximum concentration limit (MCL)) at a concentration that is as low as feasible.
- Dr. Faustman indicated she was uncomfortable with using 15 ug/dL as a basis for defining moderate levels of soil contamination. She suggested that Ecology might want to break the moderate category into two parts (5-10 and 11-15).

Defining Moderate Levels of Lead in Soils – Potential Impacts on Ground Water

One of the assumptions underlying Ecology's working definition for moderate levels of lead is that "soils with lead concentrations less than 1000 mg/kg do not pose a significant threat to ground water". Ecology previously asked the Board whether they believe this assumption is consistent with current scientific information. Pete Kmet presented the results of several studies

conducted on orchard lands, areas near former smelters and/or roadsides where lead soil concentrations were measured at several depth intervals. Those studies indicate that lead is fairly immobile in soils with elevated levels of lead in soils reported in the various studies being limited to near surface soils (the upper 18-24 inches). The soil arsenic profiles suggest some limited leaching of arsenic may be occurring (primarily movement from shallow surficial soils with re-absorption to deeper soils). In addition, Pete presented data from a ground water study done in the Gleeed area of Yakima County. This is an area historically used for Orchards. The data showed no lead impacts on ground water and a few wells with slightly elevated arsenic concentrations (~5 ppb). The Board discussed the information included in the presentation and reached the following conclusions:

- Based on soil profile data, migration of lead from soils to ground water does not appear to be a problem in agricultural areas. However, the Board expressed concern that the Gleeed study did not have soil data confirming lead arsenicals had actually been used.
- There are still questions on the potential migration of lead from soils to ground water in areas near former smelters. Specifically, differences in clay content, iron oxides, soil pH and rainfall may result in a higher potential for downward migration in areas surrounding former smelters. In particular, emissions from the smelter may have lowered pH levels in surface soils which would increase lead mobility (lower the Kd value). The Board recommended that Ecology compile ground water data from cleanup sites in smelter impacted areas to ascertain whether lead and arsenic migration to ground water has occurred. Rob Duff (DOH) also volunteered to compile monitoring data from public wells in smelter impacted areas from DOH records.

Defining Moderate Levels of Lead in Soils – Review of Information Prepared in Response to SAB Questions

- **Variability in Soil Lead Concentrations:** At the March 18th meeting, the Board requested additional information on the variations in soil lead concentrations in Washington. In response to that request, Ecology summarized information collected from schools in Eastern and Western Washington. This information was designed to illustrate (1) the variations in lead concentrations at individual properties and (2) strategies for dealing with this variability during study design and interpretation of results. The Board reviewed and discussed the information. In general, the Board expressed the opinion that the data presented provided a better sense of the variability in lead concentrations at individual properties. Dr. Landau observed that soil concentrations are highly variable with no obvious pattern. Dr. Faustman stated it would be interesting to see the full range of property results to see what percentage of properties have soil concentrations that fall into the 100 to 250 mg/kg concentration range.
- **Variations in Blood Lead Concentrations in Washington:** At the March 18th meeting, the Board reviewed and discussed the results of blood lead testing conducted in Washington. In reviewing that information, the Board observed that it is difficult to interpret the available data because blood lead testing performed in Washington is non-random (children are tested only if parent requests testing or the physician recommends testing). They suggested that Ecology examine the NHANES III data for Washington State (which included a random sampling design) separately from the blood lead testing results that are collected from clinics where children are tested only upon request. Ecology reported that the NHANES III data is

included in the Department of Health data summaries. However, DOH does not recommend using the Washington data to perform separate evaluations because the Washington data is a subset of the national dataset. Rob Duff (DOH) stated that a study performed by DOH in the mid-1990s may include blood lead testing results that represent random samples from several Washington communities. The Board recommended that Ecology work with DOH to determine whether that study would provide additional information on the variations in blood lead concentrations in Washington children.

- **Dermal Contact with Lead-Contaminated Soils:** One of the assumptions underlying Ecology's working definition for lead-contaminated soils is that "dermal contact with lead-contaminated soils does not represent a significant contributor to overall lead exposure". Ecology asked the Board whether this assumption is consistent with current scientific information. Prior to the meeting, Ecology had provided the Board with additional information to support the following conclusions: (1) dermal absorption from lead-contaminated soils is limited and use of a dermal absorption factor of 0.1% is a reasonable approach for evaluating exposure; (2) dermal contact with lead-contaminated soils does not represent a significant source of exposure relative to other potential pathways; and (3) explicit consideration of lead exposure via dermal contact does not significantly change blood lead concentrations predicted by the IEUBK model. The Board briefly discussed this issue and the additional information materials and then concurred with Ecology's conclusions on this issue.
- **Lead Exposure Resulting From Inhalation of Re-Suspended Soils:** One of the assumptions underlying Ecology's working definition for moderate levels of lead is that the default airborne lead concentration included in the IEUBK model is unlikely to be lower than the airborne lead concentrations resulting from the re-suspension of lead-contaminated soils. Ecology asked the Board whether use of the IEUBK default was a reasonable approach for evaluating this pathway. Prior to the meeting, Ecology provided the Board with additional information to support the following conclusions: (1) the EPA Screening Model provides a conservative approach for estimating airborne lead concentrations resulting from re-suspension of contaminated soils; (2) Screening analyses indicate that predicted airborne lead concentrations are 1-2 orders of magnitude below the IEUBK default concentrations when the evaluation is performed using region-specific parameters from the EPA guidance document; and (3) This exposure pathway is a relatively small contributor to overall lead exposure and, consequently, the blood lead concentrations predicted at various soil lead concentrations are not significantly changed even if the default airborne lead concentration is increased or decreased by an order of magnitude. The Board briefly discussed this issue and concurred with Ecology's conclusions that the IEUBK default value provides a conservative approach for evaluating this pathway. The Board encouraged Ecology to review data from the Spokane air quality study conducted by Washington State University and the University of Washington. In addition, the Board encouraged Ecology to review the parameters and assumptions used in the IEUBK model regarding lead uptake via inhalation.

Public Comment

- Donna (???) (Public Health Seattle King County) stated that the health department and Ecology were beginning the next round of sampling to determine the smelter plume footprint. She noted that windblown/construction-related dust emissions may be a significant problem because she was aware of at least one construction site near a local school where it appeared that very little was being done to control dust levels.
- Warren Hanson said he appreciates the Board's focus on the types of actions that might be taken at a particular site. For example, soil sampling makes sense for school properties. However, there are situations where a property is being developed and/or site conditions are changing and soil sampling does not make sense.

Defining Moderate Levels of Lead in Soils – Review of Information Prepared in Response to SAB Questions (Continued)

- **Predicting Lead Concentrations in Indoor Dust:** One of the assumptions underlying Ecology's working definition for lead contaminated soils was that lead concentrations in indoor dust can be predicted by multiplying outdoor soil concentrations by 0.7. Prior to the meeting, Ecology provided the Board with additional information to support the following conclusions: (1) many sources contribute to indoor dust; (2) a soil-to-dust transfer factor of 0.7 is a reasonable approach for estimating lead concentrations in indoor dust that is derived from outdoor soils; (3) lower values (0.45) have been used in site-specific evaluations in Washington (subdivision where proposed homes would not contain lead-based paint and soils and dust would not be affected by historic use of leaded gasoline); and (4) variability in the soil-to-dust transfer ratio is a small contributor to the overall variability in exposure estimates for soil/dust ingestion pathway.
 - Dr. Faustman expressed the opinion that the Dupont exposure situation (new roads, new homes built without lead-based paint) was not representative of all situations in Washington and, consequently, it would be inappropriate to use a soil-to-dust transfer ratio of 0.45.
 - The Board agreed that a value of 0.7 was reasonable, but probably not conservative. Dr. Duncan noted that available data from Washington (e.g. Exposure Pathway Study data) do not suggest the need to modify the default value. The Board recommended that Ecology review a paper that examined soil-to-dust relationships in areas surrounding the Chernobyl nuclear plant.
 - The Board agreed that information on the use of Asarco slag in insulation materials used in Washington homes was not directly relevant when evaluating and selecting actions to reduce exposure to lead-contaminated soils. However, the Board agreed this type of information would be an important design consideration if someone chose to conduct a study to examine soil-dust relationships in Washington homes.
- **Lead Exposure Resulting From Incidental Soil/Dust Ingestion:** One of the assumptions underlying Ecology's working definition for lead contaminated soils is that the default soil/dust ingestion rates in the IEUBK model are reasonable parameters for evaluating exposure in Washington State. Prior to the meeting, Ecology provided the Board with additional information to support the following conclusions. The Board briefly discussed

this issue and concurred with Ecology's conclusions that the IEUBK default value provides a sound approach for evaluating this pathway.

- Use of Default Soil/Dust Ingestion Rates: The range of soil/dust ingestion rates is reasonable and not inconsistent with Washington data (one of the studies used by EPA to select the default parameters was conducted in the Richland WA area. The Board expressed the opinion that there is a fairly high threshold of information needed to justify the use of alternate values and that such information is not available for Washington State. In reviewing the materials, the Board noted that the IEUBK default values (85 to 135 mg/day) are lower than the MTCA default values. However, the Board considered this was reasonable given that the IEUBK model addresses variability using a different approach than the approach reflected in MTCA and standard EPA exposure guidance. Specifically, the equations in the MTCA regulations are designed to estimate reasonable maximum exposures (RME) that represent high-end exposures (90th – 95th percentile). The IEUBK model is designed to produce central tendency estimates (CTE) which are then used with a geometric standard deviation (GSD = 1.6) to estimate blood lead concentrations at the high end of the exposure spectrum which correspond to the RME values.
 - Bare Soils vs Grass-Covered Soils: The Board discussed how exposure potential might differ between bare soils and grass-covered soils. The Board noted that one intuitively concludes that there was higher potential for soil exposure where children were playing in bare soils as opposed to grass-covered soils. Indeed, agencies typically recommend planting grass in bare areas where children play as an immediate measure to reduce exposure. However, information is not available to support a conclusion that soil ingestion rates should be modified (either up or down) depending on whether exposure is occurring in bare soils or grass-covered soils. Specifically, one of the primary studies used to develop the default soil ingestion rates (Calebrese et al.) was conducted in Amherst MA where children routinely played on grass lawns. However, some of the other studies (Binder et al. and Davis et al.) were conducted in drier climates (Butte MT and Richland WA) areas where children might encounter bare soils on a more frequent basis.
 - Information Materials: Dr. Landau recommended that information materials be prepared for different audiences to consider situations where there was a potential for soil/dust ingestion (e.g. children playing in orchards, orchard workers, etc.).
 - Citations: Dr. Faustman recommended that the citations for the soil ingestion rates be revised to include standard EPA exposure guidance documents (as opposed to values developed through individual projects such as EPA's evaluation of exposure to CCA treated wood and the EPA Science Advisory Panels review of the evaluation).
- **Lead Exposure Resulting From the Consumption of Homegrown Vegetables:** One of the assumptions underlying Ecology's working definition for lead contaminated soils is that lead concentrations resulting from the uptake of lead into homegrown fruits and vegetables are not significantly different than the lead concentrations present in the national food supply. Prior to the meeting, Ecology provided the Board with additional information to support the following conclusions: (1) lead concentrations in homegrown vegetables may be

significantly higher than lead concentrations reported in the national food supply; and (2) this pathway may be a significant contributor to overall lead exposure.

- Default Assumption: The Board agreed that available information indicates that it is not reasonable to assume that lead concentrations in vegetables grown in lead-contaminated soils are similar to lead concentrations found in the national food supply.
- Plant Uptake vs Soil on Food Surface: The Board recommended that Ecology evaluate the relative contribution of lead exposure resulting from (1) lead uptake into plant tissue and (2) lead-contaminated soils that cling to the plant surface. The Board noted that this distinction is important when considering the types of actions to reduce exposure. Dr. Norman that different soil concentrations may justify washing or peeling vegetables versus not consuming vegetables (or replacing the soils in home gardens).
- Relative Importance of the Pathway: The Board concluded that (based on IEUBK screening results and California Leadsread Model) that this pathway could be a significant source of exposure to lead-contaminated soils. Greg Glass noted that a wide range of factors influence exposure via this pathway. He looked at this issue in detail as part of the risk assessment for the areas around the Tacoma smelter and concluded that a person would have to consume approximately a half pound of vegetables a day to receive a dose of arsenic that was comparable to the dose from soil ingestion. He also concluded that a person would probably receive a higher level of exposure to lead-contaminated soils clinging to vegetables than the person would receive due to the uptake of lead into the plant tissue.
- Commercial Produce Grown in Washington: Dr. Landau recommended that Ecology consider the concentrations of lead in vegetables grown commercially in Washington as opposed to the national food supply. While commercially grown vegetables are not addressed by the Task Force recommendations, such information might result in changes to assumptions on (1) background blood lead concentrations/exposures or (2) food ingestion contribution

➤ **Revisions/Clarifications/Expansions to Ecology Working Definition for Lead-Contaminated Soils:**

- Incremental Exposure: The Board recommended that Ecology evaluate the incremental exposure and health effects associated with lead-contaminated soils. The dividing lines between (1) low and moderate and (2) moderate and high should be based on incremental impacts on blood lead concentrations.
- Estimating Soil Exposure: The Board recommended that Ecology focus on three main pathways for soil-related lead exposure: (1) incidental soil/dust ingestion; (2) consumption of homegrown vegetables; and (3) inhalation of re-suspended soils and dusts. The IEUBK model and default parameters provide a sound approach for estimating soil related exposure.

- Actions to Reduce Exposure: Actions to reduce exposure should be incorporated into the working definition for moderate levels of lead-contaminated soils. Those actions should focus on steps to reduce exposure from three main pathways identified above.
- Blood Lead Concentrations and Multiple Categories: The Board discussed whether Ecology should consider dividing the moderate category into two parts: (1) actions to address soils with the potential for causing blood lead concentrations between 5 and 10 ug/dL and (2) actions to address soils with the potential for causing blood lead concentrations between 10 and 15 ug/dL. As discussed above, this approach might be analogous to the approach used by EPA when establishing drinking water standards. Under that approach, EPA established a health-based goal (maximum concentration limit goal (MCLG)) and then establishes the regulatory limit (maximum concentration limit (MCL)) at a concentration that is as low as feasible.

Defining Moderate Levels of Arsenic in Soils - Overview

Due to time constraints, the Board did not discuss this topic. Draft discussion materials were distributed for the Board's review prior to the June 22nd meeting.

Public Comment

Karen Pickett: Expressed concerns that recommending actions such as education below the MTCA Method-A cleanup level is not without cost. There is a psychological impact on residents and educational costs are not cheap (current spending amounts to \$100,000/yr on education in the University Place area.)

Jim White: While the current focus on schools is appropriate it is important for the Board to keep in mind that the IEUBK is modeling pre-school age children. These children are more likely to be home and receive higher exposures.

Rob Duff : Volunteered to provide water supply monitoring data from the Department of Health data tracking system.